



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/045,278 | 01/14/2002 | Oliver Gehring | PEK-In1112 | 4446 |

7590

07/08/2003

LERNER AND GREENBERG, P.A.

Post Office Box 2480

Hollywood, FL 33022-2480

EXAMINER

PIZARRO CRESPO, MARCOS D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 07/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicant N .

10/045,278

Applicant(s)

GEHRING ET AL.

Examiner

Marcos D. Pizarro-Crespo

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Art Unit: 2814

Attorney's Docket Number: PEK-In1112

Filing Date: 1/14/2002

Claimed Foreign Priority Date: 1/12/2001 (DE 101 01 270.5)

Applicant(s): Gehring, et al.

Examiner: Marcos D. Pizarro-Crespo

DETAILED ACTION

This Office action responds to Application Ser. No. 10/045,278 filed on 1/14/2002.

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3-6, and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Fang (US 6316293).
4. Regarding claim 1, Fang shows (see, e.g., figs. 4-5I) all aspects of the instant invention including a method for fabricating embedded nonvolatile semiconductor memory cells, which comprises the steps of:

- providing a substrate divided into a high-voltage region, a memory region, and a logic region (see, e.g., fig. 5a)
 - forming a first insulating layer **108** on the substrate in the high-voltage region, the memory region, and the logic region (see, e.g., fig. 5b)
 - removing the first insulating layer **108** from the memory region (see, e.g., fig. 5c)
 - forming a second insulating layer **119** in the high-voltage region, the memory region, and the logic region (see, e.g., fig. 5d, col.6/II.29-36)
 - forming a charge-storing layer **122** in the high-voltage region, the memory region, and the logic region (see, e.g., fig. 5d)
 - patterning the charge-storing layer **122** in the memory region (see, e.g., figs. 5e and 5f)
 - forming a third insulating layer **130** in the high-voltage region, the memory region, and the logic region (see, e.g., fig. 5h, col.7/II.4-11)
 - removing the first to third insulating layers and also the charge-storing layer from the logic region (see, e.g., fig. 5h)
 - forming a fourth insulating layer in the high-voltage region, the memory region, and the logic region (see, e.g., col.7/II.10-34)
 - forming and patterning a conductive control layer **144** in the high-voltage region, the memory region, and the logic region (see, e.g., figs. 5j and 5k)
5. Regarding claim 3, Fang shows that the second insulating film may be thermally oxidized to a thickness between 7-10 nm (see, e.g., col.6/II.30-36).

Art Unit: 2814

6. Regarding claim 4, Fang shows that a high-voltage oxide layer is formed from the first and second insulating layers (see, e.g., col.6/ll.30-36).
7. Regarding claim 5, Fang shows that the charge-storing layer may be an electrically conductive layer (see, e.g., col.6/ll.38-40).
8. Regarding claim 6, Fang shows that the third insulating layer may be an oxide-nitride-oxide layer (see, e.g., col.7/ll.4-9).
9. Regarding claim 9, Fang shows that the fourth layer may be thermally oxidized. (see, e.g., col.7/ll.10-34)

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fang in view of Babayan (US 6194036).

13. Regarding claim 2, Fang shows most aspects of the instant invention (see paragraphs 4-9 above).

Fang also shows that the second insulating layer is an oxide layer formed to a thickness of 18 nm. Although, the claimed thickness (20-25 nm) and the prior art thickness (18 nm) do not overlap, it has been held that a *prima facie* case of obviousness exists where the claimed values and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. It appears that the differences in thickness between Fang and the claimed invention produce no change in the properties of the second insulating layer and therefore would have been obvious (*Titanium Metals Corp of America v. Banner*, 778 F.ed 775, 227 USPQ 773 (Fed. Cir. 1985)).

Fang also shows that the second insulating layer is thermally oxidized instead of deposited, as it is claimed. Nonetheless, thermal oxidation and deposition processes are known in the art as equivalent techniques, either of which could both be used to form Fang's second insulating layer (Babayan/col.1/ll.20-28). In fact, there are some deposition techniques that will allow reducing the thermal budget of the manufacturing process (Babayan/col.1/ll.20-28). It would have been obvious at the time of the invention to one of ordinary skill in the art to use a deposition process to form Fang's second insulating layer, as suggested by Babayan, to reduce the thermal budget of the manufacturing process.

Art Unit: 2814

14. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fang in view of Ghandhi.

15. Regarding claim 7, Fang shows most aspects of the instant invention (see paragraphs 4-9 above). Fang also shows a step of removing the third insulating layer and the charge-storing layer (see, e.g., fig. 5h, col.7/ll.4-11), but fails to specify that this step be carried out using dry etching. Nonetheless, using a dry etching process would avoid undercutting problems of the patterning film (see, e.g., Ghandi/pp.620).

Accordingly, it would have been obvious at the time of the invention to use dry etching to remove the third insulating layer and the charge-storing layer of Fang, as suggested by Ghandi, to avoid undercutting problems of the patterning film.

16. Regarding claim 8, Fang shows most aspects of the instant invention (see paragraphs 4-9 above). Fang also shows the step of removing the third insulating layer and the charge-storing layer (see, e.g., fig. 5h, col.7/ll.4-11), but fails to specify that this step be carried out using wet etching. Nonetheless, using a wet etching process may help in keeping residual surface contamination to a minimum (see, e.g., Ghandi/pp.589).

Accordingly, it would have been obvious at the time of the invention to use wet etching to remove the third insulating layer and the charge-storing layer of Fang, as suggested by Ghandi, to keep residual surface contamination to a minimum.

17. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fang in view of Wu (US 6261964).

Art Unit: 2814

18. Regarding claim 10, Fang shows most aspects of the instant invention (see paragraphs 4-9 above). Fang (col.7/ll.38-43) also teaches to use a photoresist mask during the steps of forming and patterning the conductive control layer, but fails to teach the use of a hard mask. Nonetheless, hard mask are known in the art as substitutes for photoresist masks (see, e.g., Wu/col.43/ll.24-35).

Accordingly, it would have been obvious at the time of the invention to one of ordinary skill in the art to replace Fang's photoresist mask with a hard mask, as suggested by Wu, since hard masks are known in the art as substitutes for photoresist masks.

Conclusion

19. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

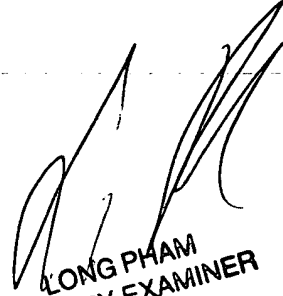
20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(703) 308-6558** and between the hours of 9:30 AM to 8:00 PM (Eastern Standard Time) Monday through Thursday or by e-mail via Marcos.Pizarro@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (703) 308-4918.

Art Unit: 2814

21. Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 308-0956**.

22. The following list is the Examiner's field of search for the present Office Action:

| Field of Search | Date |
|---|-----------|
| U.S. Class / Subclass(es): 438/258,275-279 | 7/4/2003 |
| Other Documentation: PLUS Analysis | 4/16/2003 |
| Electronic Database(s): EAST (USPAT, EPO, JPO, PGPub) | 7/4/2003 |



LONG PHAM
PRIMARY EXAMINER

Marcos D. Pizarro-Crespo
Patent Examiner
Art Unit 2814
703-308-6558
marcos.pizarro@uspto.gov